distinctly by the bright zone No. 14, the most brilliant portion of the system.

Cassini's Division.—This division has varied in distinctness, being sometimes better seen either on the eastern or the western ansa.

The Outer Ring.—This ring is the great difficulty of the planet, requiring an opportunity of the most choice kind to determine its markings. The lightest portion is certainly on the side next Cassini's division, but does not come close to it, and on the exterior next the sky there is also a faint line of light. This causes an appearance of shade through the central portion of the ring, but no indication of Encke's division could be detected.

39 *Circus Road,*
St. John's Wood.

Mr. Green has presented to the Society a drawing of *Saturn*, as observed by him in 1884.

Observations of Comet 1884 *III.* (*Wolf*) *at Harrow.* By G. L. Tupman.

The observations were taken with crossed-bar reticule on the $4\frac{1}{2}$-inch equatorial, and power 66. The zero reading of the position circle was carefully determined on eleven nights by a star near the Meridian. The comet had always a well-defined, almost stellar nucleus, which could be very accurately observed. The disappearances and reappearances at the edges of the bars at each transit have been considered as forming a single comparison. The comparisons on Oct. 22, 26, Nov. 18 to end were registered on the chronograph; the others were made by eye and ear. The differences of R.A. and of Declination have been corrected for defective orientation and error of perpendicularity of the bars, for the comet's geocentric motion, and for refraction.

For the parallaxes, log. Δ has been taken from the Ephemeris by Dr. Krueger in the *Astronomische Nachrichten*, with mean solar parallax $8''\cdot83$.

1884.	Green. Mean Time.	☄ − ✱ Δα	Δδ	No. of Comp.	☄ app. α	Par.	☄ app. δ	Par.	✱
	h m s	m s	′ ″		h m	s	° ′ ″	″	
Sept. 24	10 38 0	−1 12·81	+6 34·4	11, 11	21 17 23·00	+0·20	+20 36 14·9	+5·8	1 (*a*)
25	9 46 4	−0 22·65	−8 48·8	13, 13	21 17 58·71	+0·10	+20 9 36·8	+5·8	2
27	10 45 50	+2 35·90	−6 30·6	12, 12	21 19 22·53	+0·23	+19 12 31·2	+6·2	3
Oct. 4	9 17 52	+0 19·29	+0 57·6	5, 5	21 25 33·94	−0·12	+15 51 45·5	+6·5	4 (*b*)
	9 59 47	+0 21·28	+0 6·7	6, 6	21 25 35·93	−0·03	+15 50 54·6	+6·5	4
	10 23 34	+0 22·22	−0 18·8	5, 5	21 25 36·87	+0·02	+15 50 29·1	+6·5	4
13	11 29 16	−3 24·43	+2 57·1	9, 9	21 36 55·43	+0·27	+11 23 55·6	+7·3	5
22	9 30 22	+2 55·75	−3 44·0	10, 10	21 51 20·94	+0·20	+ 7 12 30·1	+7·5	6 (*c*)
26	10 4 32	−1 6·71	+1 50·9	19, 19	21 58 49·16	+0·26	+ 5 26 29·8	+7·6	7
Nov. 7	10 27 53	+0 55·72	+4 55·1	12, 12	22 23 56·72	+0·31	+ 0 49 31·3	+7·6	8 (*d*)
8	9 40 20	−0 41·79	−0 39·8	14, 14	22 26 7·06	+0·24	+ 0 30 14·1	+7·5	9 (*e*)
18	9 41 0	−1 31·08	+5 15·3	14, 14	22 49 38·61	+0·25	− 2 22 33·2	+7·2	10
19	6 19 34	+0 35·33	−7 17·5	18, 18	22 51 45·01	−0·06	− 2 35 6·0	+7·3	10 (*f*)
20	9 28 34	−0 9·42	−1 15·7	20, 20	22 54 31·30	+0·23	− 2 50 59·8	+7·2	11
21	5 56 32	−0 11·59	+2 13·1	15, 15	22 56 37·61	−0·09	− 3 2 39·8	+7·2	12
Dec. 9	6 34 15	+0 27·40	+6 47·6	18, 18	23 42 25·41	+0·01	− 5 45 33·6	+6·5	13 (*g*)
15	6 1 59	+0 28·10	−3 14·5	24, 24	23 57 51·95	−0·02	− 6 9 22·5	+6·2	14
1885. Jan. 7	6 48 36	−1 38·77	+2 9·1	11, 11	0 56 56·14	+0·07	− 5 53 15·0	+5·1	15 (*h*)
	6 48 36	−1 51·78	+3 8·8	11, 11	0 56 56·14	+0·07	− 5 53 17·2	+5·1	16
Feb. 5	6 56 43	+0 43·43	+1 22·7	16, 16	2 8 27·66	+0·10	− 3 9 21·7	+4·0	17 (*j*)

Notes.—(*a*) Sept. 24. Comet has stellar nucleus 2″ or 3″ diam., 9½ mag. Coma perhaps 2′ diameter, no tail. Object glass dewed. (*b*) Oct. 4. Coma 2′ diam.; nucleus 2″; 10 mag. No tail. (*c*) Oct. 22. Fog; object glass much dewed. Observations unsatisfactory. Nucleus distinct, 10 mag. Coma large and faint. (*d*) Nov. 7. Moonlight; some haze. Comet is brighter? (*e*) Nov. 8. Comet bright, 4′ or 5′ diam.; nucleus sub-stellar, 11 mag. Fine night. (*f*) Nov. 19. Comet's diameter about 4′. The central condensation is brighter than it was, and larger, perhaps 4″ or 5″. No signs of tail, but the coma is not uniformly luminous. (*g*) Dec. 9. Diameter 5′. Central condensation about same brightness as before. (*h*) Jan. 7. Comet very much fainter. Nucleus still stellar; getting difficult to observe well. (*j*) Feb. 5. Faint and difficult; diameter 1½ or 2′. Nucleus stellar, glimpsed at intervals. Very fine night.

Mean Places of the Comparison Stars.

	1884·0. h m s	s	1884·0. ° ′ ″	″		
1	21 18 32·42	+3·39	+20 29 10·4	+30·1	B.B. vi. +20°·4902	
2	21 18 17·98	+3·38	+20 17 55·4	+30·2	Berlin Zones 1881, 2 obs.*	
3	21 16 43·29	+3·34	+19 18 31·6	+30·2	9-year, 1997.	
	21 16 43·28		+19 18 31·2		Berl. Jahrb.	
4	21 25 11·61	+3·30	+15 50 5·2	+30·1	LL. 41860.	
	21 25 11·43		+15 50 21·3		W.B. xxi. 550.	
	21 25 11·39		+15 50 21·9		Rümker 9228.	
	21 25 11·35		+15 50 17·8		Berlin Zones 1870, 3 obs., adopted.†	
5	21 40 16·48	+3·27	+11 20 28·9	+29·5	LL. 42432	P.M. in decl. −0″·315 has been applied.
	21 40 16·77		+11 20 28·8		W.B. xxi. 936	
	21 40 16·59		+11 20 29·0		Lamont$_4$ 2791	
6	21 48 22·05	+3·19	+ 7 15 44·8	+28·6	Lamont$_2$ 6182	mean adopted.
	21 48 21·94		+ 7 15 46·1		BB. vi. 4763	
7	21 59 52·36	+3·20	+ 5 24 11·2	+28·0	Piazzi xxi. 390.	
	21 59 53·00		+ 5 24 12·5		W.B. xxi. 1351.	
	21 59 52·67		+ 5 24 10·9		Taylor 10246 (adopted).	
8	22 22 57·76	+3·16	+ 0 44 9·9	+26·1	Lamont$_1$ 8848	mean adopted.
	22 22 57·70		+ 0 44 12·6		Harvard Zones 77,5	
	22 22 57·92		+ 0 44 10·3		BB. vi. +0°·4878	
9	22 26 45·74	+3·17	+ 0 30 27·9	+26·0	LL. 44036.	
	22 26 45·65		+ 0 30 28·1		Lamont$_1$ 8879.	
	22 26 45·56		+ 0 30 27·5		Harvard Zones 73,70.	
	22 26 45·68		+ 0 30 27·9		Schj. 9218 (adopted).	
10	22 51 6·53	+3·16	− 2 28 12·6	+24·2	Lamont$_1$ 9034.	
		+3·15		+24·1		
11	22 54 37·57	+3·15	− 2 50 8·0	+23·9	W.B.$_1$ xxii. 1110.	
12	22 56 46·87	+3·15	− 3 5 13·8	+23·7	Lamont$_3$ 4700.	
	22 56 46·05		− 3 5 16·6		Peters A.N. 2655 (adopted).	
13	23 41 55·30	+3·15	− 5 52 49·1	+20·2	W.B.$_1$ xxiii. 821.	
	23 41 55·31		− 5 52 54·4		Rümker 11582.	
	23 41 54·86		− 5 53 1·0		Albany Mer. Obs. A.N. 2657 (adopted).	
14	23 57 20·69	+3·16	− 6 6 27·1	+19·1	W.B.$_1$ xxiii. 1152.	
	1885·0.		1885·0.			
15	0 58 35·00	+0·17	− 5 55 24·4	− 5·3	W.B.$_1$ 0.998.	
	0 58 34·74		− 5 55 18·8		A.N. 2657 (adopted).	
16	0 58 47·75	+0·17	− 5 56 20·7	− 5·3	A.N. 2657.	
17	2 7 44·04	+0·19	− 3 10 35·4	− 9·0	Schj. 649.	

* Kindly communicated by Dr. Becker.

† Kindly communicated by Dr. Auwers.

Five orders of Meteor Streams or Comets. By Richard A. Proctor.

The importance of Mr. Denning's discovery (which must now, I presume, be regarded as established), that the members of certain meteor systems radiate sometimes for months in succession from the same point in the star sphere, induces me to make some remarks upon the subject, with the view chiefly of recommending it to the attention of those who have time for the observation of meteors and shooting stars. I am the more disposed to do this because four or five years ago, when as yet Mr. Denning's discovery was not established, I pointed out the startling inferences deducible from it, as reasons for doubting—at that stage of his observations—whether the discovery could be real. Yet, fully twelve years ago, I had indicated a theory respecting the origin of comets and meteor-systems which would point to the belief that the relations resulting from Mr. Denning's discovery must in reality exist, startling though they are.*

It should not be necessary to state, in addressing the Fellows of the Astronomical Society, that Mr. Denning's discovery can bear but one interpretation. It proves that the motion of the Earth in her orbit round the Sun is almost at rest compared with the velocities of the members of those meteoric families which have an unchanging, or a very slightly changing radiant, for months in succession. Without assuming that the radiants can be determined with anything like the precision claimed by Mr. Denning (noticing indeed that if this were possible, then in the case of some meteor systems the effects even of our Earth's rotation could be detected in a change of radiant during a shower lasting five or six hours), it is certain that we have to deal, in the case of the long-lasting radiants, with bodies travelling at the rate of hundreds of miles per second. This is certain, without taking into account the effects of the Sun's attraction in modifying the direction of the movements of these meteors; but as a matter of fact the Sun's attraction cannot greatly alter (at the Earth's distance) the directions of bodies already moving with velocities far exceeding those he can impart. I have shown this mathematically in recent numbers of *Knowledge*, in which the simple but apparently little known mathematical relations involved have been somewhat fully dealt with.

Another point in Mr. Denning's discovery is also significant in the same direction. The point was not necessary to demonstrate what the discovery unquestionably proves; but it affords very interesting independent evidence. The meteors of the kind considered are seen year after year. Now this, which, in the case of systems observable only for a few hours or days at the outside, is a relation very naturally following from what is already known about such systems, has a very different meaning in the case of these meteors with long-lasting radiants. If the

* In my article on "Three Orders of Comets," *Popular Science Review* for Jan. 1873.